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Kodak Professional Notes

For Registered Owners of
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KEYS TO COLOR PRINTING

Part I (FILTERS)

COLOR PRINTING! That's the new word for today! You probably know that there are now available two new color papers: Kodak Color Print Material, Type R (Process P-111), for making pleasing color prints with a single exposure from Kodachrome and Kodak Ektachrome transparencies; and Kodak Color Print Material, Type C (Process P-122), for making color prints of high quality from Kodacolor and Kodak Ektacolor Negative Films.

Regardless of which paper will be best suited to your particular use, one of the keys to making successful color prints lies in understanding how to use color compensating filters correctly.

THE FILTERS THEMSELVES. In the first place, filters for controlling the color of the light are just as necessary in making color prints on these new materials as the paper and chemicals themselves. When the first, or test, print is viewed, the desirability of some change in color balance will probably be apparent. This is normal and will vary from one enlarger to the next and from one darkroom to

the next, with varying processing techniques or personal preferences, etc. The extent of this change can best be evaluated by placing color compensating filters over the test print.

Be sure that you hold the filters up *away* from the print; if the filters are placed in *contact* with the print, the effect of the filters is *doubled* since they will then color both the light by which the print is viewed *and* the light by which the print is illuminated. Incidentally, these filters are available in six colors: yellow, magenta, cyan, red, green, and blue. Each color is available in six densities: .05, .10, .20, .30, .40, and .50. Further information can be obtained from Kodak dealers or by consulting the "Kodak Color Films" section of the *Kodak Color Handbook*.

When the filter or filter combination which gives the most pleasing color balance is known (those used to *make* the test print plus those used to *view* the test print), it is then possible to determine what filter combination (ideally located over the negative carrier) to use

over the enlarger lens for properly printing the negative or the transparency, as the case may be. Note that the viewing filters will tinge the highlights excessively and the shadows insufficiently. The "educated eye" will have to disregard these tonal extremities and judge the effect primarily on the middle tones.

For the Type R material, the filter combination that is added to the exposing light beam should be those filters which made the test print appear best.

With the Type C material, the primary recommendation is to make three exposures in sequence through separa-

tion filters (for example, the following Kodak Wratten Filters: red, No. 70; green, No. 16 plus No. 61; blue, No. 47B plus No. 2B). Tricolor printing helps the professional photographer make drastic or subtle changes in color balance and speeds up production when printing from many different negatives. However, good prints can also be made with white light using cc filters to adjust the color of the exposing light. In the latter case, the filter or filter combination to be added should be half the complementary of the viewing filter combination.

FILTER FUNDAMENTALS

A combination of many filters, broken down into separate totals of the three subtractive primaries—cyan, magenta, and yellow—may reveal the presence of all three, which introduces neutral density. Basic rule is: *Any filter combination which contains three or more different colors can be simplified.*

Neutral density exists (and should be removed) when a part of all primary color components of white light are subtracted in passing through a system of filters.

$$\text{CC-10M} + \text{CC-10C} + \text{CC-10Y} = \text{NEUTRAL}$$

To figure the neutral density of a filter system, reduce all filter colors to their equivalents in terms of the subtractive colors: magenta, cyan, yellow.

$$\text{CC-10R} = \text{CC-10M} + \text{CC-10Y}$$

$$\text{CC-10G} = \text{CC-10Y} + \text{CC-10C}$$

Note that the color density remains the same in the division: CC-10R becomes CC-10M and CC-10Y, and *not* CC-5M and CC-5Y as you might expect. The reverse is also true: CC-20Y + CC-20C = CC-20G. Similarly, CC-10M + CC-10C + CC-10Y = .10 neutral density.

$$\text{CC-10B} = \text{CC-10M} + \text{CC-10C}$$

However, when filters of the same color are combined, the densities add normally, e.g., CC-10M + CC-20M = CC-30M.

$$\text{CC-10M} + \text{CC-20M} = \text{CC-30M}$$

COMBINING FILTERS. Obviously, in our brief space, there is not sufficient room to discuss the correct use of the various filters for each type of printing material other than to state the general principles governing their use. However, the selection of the proper filters for both materials does have one thing in common, namely, that the combination to be placed in the exposing light beam should *always be the simplest combination possible*—that which uses the fewest filters to produce the desired color correction.

There are several reasons for keeping the number of filters to a minimum: First, when prints are made by projection, definition may be impaired by scattered light unless the fewest number of filters is used; secondly, if filters of different colors are merely added together, the resulting combination may contain some neutral density, which will serve only to increase the exposure time. Remember, neutral density is present when all three colors—red, green, and blue—are absorbed.

The determination of filter combinations can usually be simplified by thinking of all the filters in terms of their subtractive colors. These relationships are:

Red (absorbs blue and green) = yellow (absorbs blue) plus magenta (absorbs green)

Green (absorbs blue and red) = yellow (absorbs blue) plus cyan (absorbs red)

Blue (absorbs green and red) = magenta (absorbs green) plus cyan (absorbs red)

The following procedure is recommended:

1. Convert the filters to their equivalents in the subtractive colors (if not already of these colors), yellow, magenta, and cyan.
2. Add these filters together (such as 20M + 10M = 30M).
3. If the resulting filter combination

contains all three subtractive colors, cancel out the neutral density.

4. If the filter combination contains two filters of equal density, substitute the equivalent single filter.

Of course, many filter determinations are not resolved so simply as in our illustrated example, and the final filter combination needed may include three or more filters. However, the four-step procedure given above applies in each case, and following it carefully will prevent the use of the wrong filters or the use of a filter combination heavier than necessary to obtain the desired color balance.

AS A FINAL WORD OF ADVICE. If you do much color printing at all with the Type R Paper, we suspect that you will want to have two complete sets of Kodak Color Compensating Filters. There may be times, for example, when the amount of any one color may be equal to 100 units of color correction. The smallest number of filters which can be used to total this amount would be two 50 CC filters. Thus, the use of only two filters would be much more desirable than adding a CC-50, a CC-40, and a CC-10, since this would represent more filters than would need to be used. In addition, in spite of the fact that filters are kept in filter holders and handled and treated carefully, they may eventually become finger marked, scratched, or dirty, and a reserve supply of filters will become a necessity. Smudged filters can be used for print-viewing purposes but they will result in prints of inferior definition if used over the enlarging lens.

P.S. Let's see how you would reduce the following filter combinations to their least number of components. (*Answers on page 8.*)

No. 1 CC-50M + CC-20R + CC-10B

No. 2 CC-50G + CC-20Y + CC-30C + CC-20G

No. 3 CC-40R + CC-30Y + CC-10C + CC-30B

No. 4 CC-30B + CC-30C + CC-20R + CC-20M

EXAMPLE

Filters in enlarger

Example: Suppose that a test print on Kodak Color Print Material, Type R, was exposed with CC-30M and CC-20R filters in the light beam.

Filters used to view print

Now suppose that the test print looked best when viewed through a CC-10B plus a CC-10M. The problem is to combine the filters in the enlarger and the filters used to view the print.

In subtractive terms, the CC-10B is equivalent to a CC-10C plus a CC-10M; also, the CC-20R is equivalent to a CC-20M plus a CC-20Y. The CC-30M is already a subtractive color and need not be converted.

The filters to be used in exposing the final prints are, then, CC-30M, CC-20M, CC-20Y, CC-10C, CC-10M, and CC-10M. The sum is CC-70M plus CC-10C plus CC-20Y.

However, since equal densities of all three subtractive filters are equivalent to a neutral density, a density equal to that of the lightest filter can be eliminated from the combination. In other words, CC-10Y plus CC-10M plus CC-10C is neutral density and should be removed, since it is not adjusting the *color* of the exposing light.

The result of canceling out the neutral density is to leave CC-60M plus CC-10Y.

This combination is equivalent to CC-50M plus CC-10R (because $CC-10M + CC-10Y = CC-10R$ plus a remainder of only CC-50M).

Although either one of these combinations represents the same amount of filtration, the second one (CC-50M plus CC-10R) should be selected, because only two filters would then be used as compared with three (CC-10M + CC-50M + CC-10Y) in the other case, .50 being the highest density available in a single filter. This gives the required correction with the minimum number of filter surfaces.

SUBTRACTIVE EQUIVALENTS

<div><div></div><div></div><div></div><div>CC-30M</div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div><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CC-60M CC-10Y

The diagram illustrates the assembly of a 10M cable. It shows a vertical stack of components: a top section labeled 'CC-50M' (pink), followed by a section labeled 'CC-10M' (pink), then a section labeled 'CC-10Y' (yellow), and finally a bottom section labeled 'CC-10R' (pink). The components are connected by horizontal lines, representing the cable's structure.

LESSON IN LIGHTING

Photographs by Rick Warner, Kodak Professional Studios

PICTURES are made, not born! And it fascinates us to follow a photographer's thinking as he builds up the lighting in his studio. Although no two subjects ever require *exactly* the same lighting, it seems to us that this mixer illustration comes as close as anything could to being typical of small-object commercial photography for catalogue use as anything could. In other words, we bet that with this lighting setup, more miscellaneous objects of similar size, such as gears, fishing reels, and cigarette lighters, could be photographed satisfactorily than with any other basic lighting arrangement one might devise. Step by step, here's how it happened:



1. A spot—this one outfitted with a “snoot” to cast a sharp-edged circle—was positioned at the conventional “45° up—45° over” location. This was the indoor sun that gave shape and form to the mixer and, incidentally, determined the exposure level at which the picture was taken.



2. A light—another spot—was used on the background to separate from its surroundings the outline of the mixer—particularly its “black” top cover.

Then, two more spots, one from each side, were placed behind the mixer to pick up the glass-compartment walls.

3. Two large white-cardboard reflectors finished the job. One was behind and above the chromium top to give it a white over-all reflection; the other was “tented” around the front of the mixer to soften the shadows of the main lights and to pick up a reflection in the manufacturer's name plate. (That's right, the front reflector had a circular hole cut in it for the lens to look through.)



PHOTOGRAPH with **KODAGRAPH!**

MONEY appears to have significant appeal, and new ways to make it usually bring ardent attention. We therefore entice you to the scheme outlined here. Now, we haven't developed a sure-fire method to beat the roulette wheel; that's not our specialty. But when it comes to reproducing line copy photographically, we're more adept. So, new and better ways to reproduce line copy it is.

Among the host of things we coat with all manner of photographic sensitivity exists a product line—Kodagraph Reproduction Materials (available only through Kodak Industrial Dealers)—designed expressly to reproduce anything drawn, written, typed, or printed. Kodagraph Materials involve a sweeping aggregation—for room-light- or darkroom-handling—in many shades of opacity or translucence; specific materials for use with enlargers, process cameras, low- or high-intensity contact printers, and the like; film and paper materials; fast and slow emulsions; in big rolls or packages of small sheets. All of them, though, are intended for linework photocopying.

The basis of this money-making plan is a simple, economical, fast procedure for reproducing all forms of line copy with Kodagraph Materials. Whether you're a professional photographer copying deeds, army discharges, birth certificates, and innumerable other documents; a commercial photographer offering facilities for reproducing drawings, maps, tabulations, reports, and documents; or an industrial photographer in a firm without a copying and reproduction department, Kodagraph Materials afford the solution to copying techniques.

Consider, for example, the simplicity of using Kodagraph Contact Paper with nothing more than a standard contact printer. The first exposure on Kodagraph

Contact Paper makes a reverse-reading paper negative (print-through, not reflex) from which any number of positive prints can be individually exposed. This is cheaper and faster than a camera-made film copy and the reproduction is good.

Even simpler is the one-step method for copying documents reasonably translucent and printed on just one side. One exposure in the contact printer makes a copy which is direct-reading but has its white and black areas reversed in tone. Reflex printing (light reflected from the original onto any contact-type Kodagraph paper in contact with the original) is required for originals printed on both sides or on opaque stock.

Kodagraph Autopositive Paper provides an inexpensive means, in one step, for making positive, direct-reading, same-size prints. It can be handled in room light and exposed on high-intensity contact printers or printers equipped with photoflood lamps. A transparent yellow-filter sheeting is placed over the high-intensity light source during exposure. Autopositive Paper is a unique material which is not only easy to use but means fast, economical reproduction with no intermediate steps.

For enlargements and reductions, a copying camera or a process camera, for instance, can be used with Kodagraph Projection Papers. The product of the first exposure is a reverse-reading paper negative. Using this negative with Kodagraph Contact Paper in an ordinary contact printer will produce right-reading, positive prints. But if you want right-reading paper negatives as the end product, merely affix to the camera lens a prism or front-surface mirror attachment (both available commercially but not from Kodak).

These are but (*Continued on page 8*)

<i>Equipment Needed</i>	LETTERS AND DOCUMENTS	MAPS AND CHARTS	DRAWINGS AND TRACINGS	FILM NEGATIVES
Low-intensity contact printer	Kodagraph Contact Paper, Standard or Extra Thin ⁴	Kodagraph Contact Fine-Line Paper ⁴	Kodagraph Contact Paper, Translucent or Extra Thin ⁴	Kodagraph Contact Paper, Standard or Extra Thin ¹
Contact printer equipped with photo-floods	Kodagraph Autopositive Paper, Extra Thin ⁶	Kodagraph Autopositive Film ⁵ Kodagraph Autopositive Paper, Extra Thin or Translucent ⁶	Kodagraph Autopositive Paper, Extra Thin or Translucent ⁶	
Copying camera or process camera	Kodagraph Projection Positive Paper, Standard or Extra Thin ³ Kodagraph Fast Projection Paper, Standard or Extra Thin ^{2,4}	Kodagraph Fast Projection Paper, Standard or Extra Thin ^{2,4}	Kodagraph Fast Projection Paper, Standard or Extra Thin ^{2,4}	
Enlarger				Kodagraph Projection Paper, Standard or Extra Thin ¹ Kodagraph Fast Projection Paper, Standard or Extra Thin ¹

1. One-step process—right-reading positive print.

2. One-step process—right-reading paper negative (prism or front-surface mirror on camera lens).

3. One-step process—right-reading positive print (prism or front-surface mirror on camera lens).

4. Two-step process—first, paper negative; second, positive print using Kodagraph Con-

tact Paper, Standard or Extra Thin, on low-intensity contact printer.

5. Two-step process—first, film positive; second, positive print using Kodagraph Autopositive Paper, Extra Thin, on contact printer equipped with photo-floods.

6. Two-step process—first, reverse-reading paper positive; second, positive print using Kodagraph Autopositive Paper, Extra Thin, on contact printer equipped with photo-floods.

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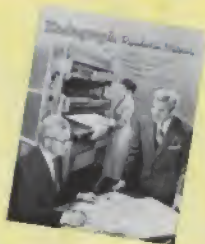
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Seattle 16 Wash

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ON REQUEST**

(See below)



KODAGRAPH

(Continued from page 6) several of the numerous applications of Kodagraph Materials which give copies of "better-than-original" quality, long life, and outstanding uniformity. Their use requires no special, expensive equipment, and processing is accomplished in standard photographic solutions. Since most documents measure $8\frac{1}{2}$ by 11 or $8\frac{1}{2}$ by 14 inches, you'd be wise to stock Kodagraph Materials in these standard sheet sizes.

To those who desire more details, Kodak is prepared to send gratis a copy of "Kodagraph Reproduction Materials," which includes a listing of packaged sizes available and their prices. This booklet describes each Kodagraph material, the stocks and emulsions available,

and their uses. Write Graphic Reproduction Division, Eastman Kodak Company, Rochester 4, New York.

And for 72 pages covering the subject from "a" to izzard, see your Kodak dealer for a copy of "How to Use Kodagraph Reproduction Materials," price 50 cents.

The condensed chart (page 7) will help you select the proper equipment and the Kodagraph Material best suited to a particular copying job. Many other combinations are possible. A more detailed chart appears in "Kodagraph Reproduction Materials."

Answers to Color Print Quiz

- No. 1 Ans: CC-60M + CC-10R (3 filters)
or
CC-70M + CC-10Y (3 filters)
- No. 2 Ans: CC-90G + CC-10C (3 filters)
- No. 3 Ans: CC-30R (1 filter)
- No. 4 Ans: CC-40C + CC-50M (2 filters)
or
CC-40B + CC-10M (2 filters)

Sales Service Division

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